Comparison of Urethral Dilation with Amplatz Dilators and Internal Urethrotomy Techniques for the Treatment of Urethral Strictures

Onur Karsli[1], Murat Ustuner[1]*, Omur Memik[1], Emre Ulukaradag[1]

Purpose: The most common option for the management of urethral stricture (US) is direct visual internal urethrotomy (DVIU), because it is an easy and minimally invasive technique but the low success and high recurrence rates of this technique make urologists research for different types of therapeutic alternatives in stricture treatment. In this study we aimed to compare the internal urethrotomy with amplatz dilation for the treatment of male US.

Materials and Methods : A total of sixty patients, who have been operated due to urethral stricture were enrolled into this study. Group 1 was treated with amplatz renal dilators and the group 2 was treated with cold knife urethrotomy. All patients were evaluated for Qmax preoperatively and at the first, 3rd, 9th and 12th months postoperatively.

Results: In the 3 month uroflowmetry results, mean Q max values were 15.6 ± 2 ml/sec in amplatz group and 15.5 ± 1.6 ml/sec in DVIU group. There was no statisticaly difference between the two groups. However the Q max values in the postoperative 9 and 12 months were significantly decreased in the DVIU group. In the DVIU group 9 recurrences (36%) appeared and 2 of these reccurrences were in the first 3 months, whereas in the amplatz group no recurrences appeared in the first 3 months. The urethral stricture recurrence rate up to the 12 month follow up was statistically significant for group 1 when it is compared with group 2.

Conclusion: In our experience, amplatz dilation is a good option as the initial treatment for urethral stricture.

Keywords: amplatz dilators; internal urethrotomy; urethral strictures; urethral strictures recurrences; uretral strictures treatment

INTRODUCTION

Urethral stricture (US) is one of the oldest known issue of urology due to the difficulty of diagnosis, treatment and risk of recurrence. US disease is defined as narrowing of the urethral lumen because of fibrosis, which occurs in urethral mucosa and surrounding tissues. The etiology could be idiopathic, iatrogenic, post-traumatic and also includes infectious and lichen sclerosus[(1)]. Although it is rare, familial stricture especially seen in adults can be considered in etiology[(2)].
Treatment of the stricture depends on the localization, length and type[(3)]. Although urethral dilation is one of the oldest modality, the most common option for the management of US is direct visual internal urethrotomy (DVIU), because it is an easy and minimally invasive technique[(4)]. Endoscopic urethrotomy was first described in 1974 by Sachse with the use of a cold-knife technique to incise the stricture segments[(5)]. Despite its widespread acceptance as the first-line option, the success rates after initial DVIU is reported to be 8%–76% [(6-8)]. Low success and high recurrence rates of this technique make urologists research for different types of therapeutic alternatives in stricture treatment [(9)]. Recently Akkoc et al. described amplatz dilation techniques for the treatment of US as an effective and safe technique[(10)].
In this study we aimed to compare internal urethrotomy with amplatz dilatation for the treatment of US. To the best of our knowledge, this is the first clinical trial in the literature comparing the outcomes of amplatz dilation with DVIU.

MATERIALS and METHODS

Study Population

In this retrospective study, we analyzed the data from 60 patients who were diagnosed with US and operated in our department between 2016 and 2017. The diagnose of US was made by clinical history, uroflowmetry and urethrography. The records of patients', physical examination, complete blood count, serum biochemical analysis, urine analysis and urine culture were retrospectively reviewed. The patients with active urinary infection were treated with the appropriate antibiotics before the operation. All patients were evaluated by urethrography preoperatively and the stricture lengths were measured. Exclusion criterias of the study were stricture longer than 2 cm, meatal stenosis, posterior urethral strictures, and history of US treatment. Patients were informed about a new dilatation technique. The

University of Health Sciences, Derince Training and Research Hospital, Department of Urology, Kocaeli, Turkey.
*Correspondence: University of Health Sciences, Derince Training and Research Hospital, Department of Urology, Kocaeli, Turkey.
Tel: +905065021260. Fax : +902622334641. E-mail: muratustuner@gmail.com.
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Table 1. Characteristics in study groups and comparability of groups treated.

Parameters	Amplatz group	DVIU Group	*P*
Age	60.7 ± 6.3	59.3 ± 4.6	0.79 [a]
Preoperative Qmax value (mL/sec)	4.9 ± 0.8	4.6 ± 0.4	0.22 [a]
Operative time (min)	15 ± 1.8	15.9 ± 3.5	0.21 [b]
Recurrence/no recurrence, n (%), 3th month	0/30	2/28	0.49 [b]
Recurrence/no recurrence, n (%), 12th month	4/25	9/21	0.02 [b]

a: Independent Samples *T* test.
b: Fisher's exact test.

patient was operated with amplatz dilation in case he accepted this technique. As a result, there were two groups of patients and each group had 30 patients. The patients in Group 1 were treated with amplatz renal dilators and group 2 were treated with DVIU.
All patients were re-evaluated by uroflowmetry at the first, 3rd, 9th and 12th month postoperatively and Qmax values were recorded.
During the follow-up period, if the patients had complaints of voiding difficulty and the maximum flow rate (Qmax) was < 10 ml/s, urethroscopy and urethrography were planned. If urethral strictures were present at urethroscopy and urethrography, these were accepted as recurrent strictures and the same procedure was performed again. The procedure was accepted as a successful one when the patient did not complain of any voiding difficulty and the Qmax was greater than 12 mL/sec[11].
The primary endpoint measures of the study was determined as an increase of Qmax. The secondary endpoint of the study was determined as the recurrence time of the stenosis.

Surgical technique

Written information consent was obtained from patients for both surgical procedure. All patients were operated by the same surgeon. All the patients underwent into urethrotomy under spinal or general anesthesia in the lithotomy position. Cephazolin sodium 1 g. i.v. was administered for preoperative antibiotic prophylaxis.
A 20.5 F urethrotome was used for the cold knife urethrotomy group. A safety guide wire was first passed through the stricture and the urethrotomy was performed at 12 o'clock. For all patients, a 20 F Foley urethral catheter was inserted and left in the bladder for 7 days at the end of the procedure.
For amplatz dilation, all patients underwent cystoscopy at lithotomy position under spinal or general anesthesia. A 0.038-inch hydrophilic guidewire was introduced into the working channel after the location of the stenosis was seen with the cystoscope (**Figure 1**). The cystoscope was then removed and amplified renal dilators between 10F to 22F were sequentially delivered to the bladder over the guide wire (**Figure 2 and 3**). After the dilation procedure, the urethra was evaluated with cystoscopy and the procedure ended by attaching a 20F foley urethral catheter and removed at postoperative 7th day (**Figure 4**).
Statistical analysis
Independent-Samples *T* test, and Fisher's exact test were used for comparing the groups of patients. P < 0.05 was considered statistically significant. The computer software that was used was Statistical Package for Social Sciences (SPSS 12.0.1; SPSS Inc., Chicago, IL, USA).

RESULTS

There were two groups of patients treated for urethral stricture. Group 1 was the amplatz dilation group and the group 2 was cold knife urethrotomy group. In both two groups there were 30 patients. The mean age of group 1 was 60.7 ± 6.3 years and in group 2 was 59.3±4.6 years. The etiology of urethral strictures were idiopathic in 20 (33,3%) and iatrogenic in 40 (66,6%) patients. Iatrogenic causes were attributed to transurethral resection of prostate, transurethral resection of bladder tumor and urethral catheterization. There was no statistically significant difference between the two groups for age (*P* = .79). The mean preoperative Qmax values for group 1 and 2 were 4.9 ± 0.8 and 4.6 ± 0.4 ml/sec, respectively (*P* = .22). There was no statistically difference between two groups (**Table 1**). Mean operation time was shorter in amplatz group (15 ± 1.8 minutes) when compared with cold-knife group (15.9 ± 3.5 minutes) but it was not statistically significant (*P* = .21).
When we compared the 3 month uroflowmetry results, mean Q max values were 15.6 ± 2 ml/sec in amplatz group and 15.5 ± 1.6 ml/sec in DVIU group. There was no statisticaly difference between the two groups (*P* = .89). However the Q max values in the postoperative 9 and 12 months were significantly decreased in the DVIU group (*P* = .001) (**Table 2**).
In the cold knife group 9 recurrences appeared and 2 of these reccurrences were in the first 3 months, whereas in the amplatz group no recurrences appeared in the first 3 months. Recurrence-free rate at 3 months was similar between two (*P* = .23). The urethral stricture recurrence rate up to the 12 month follow up was statis-

Table 2. Operative outcomes

Qmax Group	Before the operation	3th months	9thmonths	12thmonths
Amplatz	4.9 ± 0.8	15.6 ± 2	15 ± 1.8	14.2 ± 1.3
DVIU	4.6 ± 0.4	15.5 ± 1.6	13.4 ± 1.4	11.9 ± 1.2
P	0.22*	0.89*	0.001*	0.0001*

* Independent Samples *T* test.

Table 3. Surgical technique and complication

Group	Operation time Min	Complication Bleeding n(%)	UTI n(%)
Amplatz	15±1.8	1 (3.3)	1(3.3)
DVIU	15.9±3.5	3 (10)	2(6.6)
P	0.21	0.61	0.55

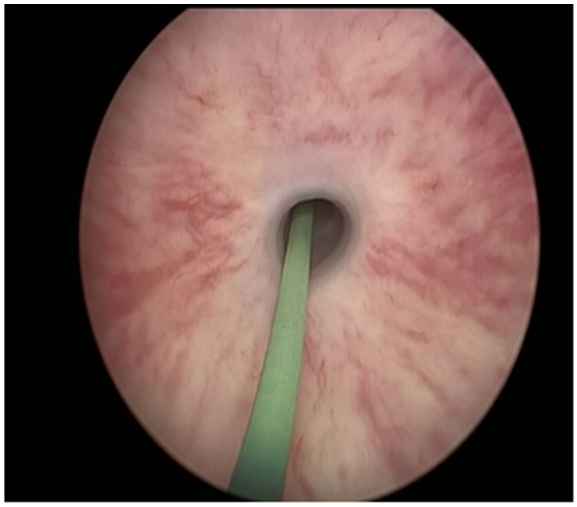

Figure 1. The image of hydrophilic guidewire which was introduced into the uretrhral stenosis area under cystoscopy

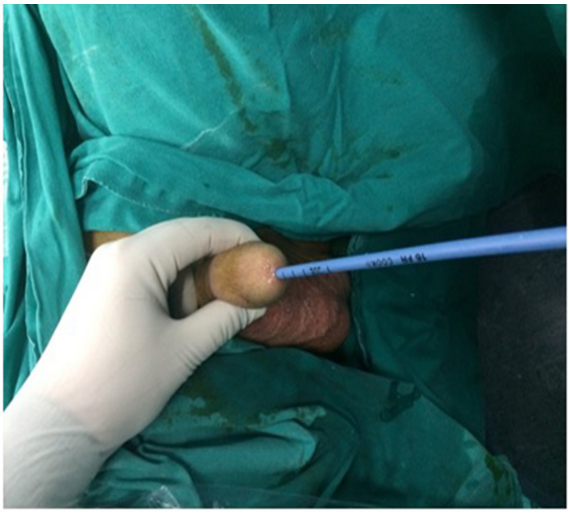

Figure 3. The image of 22 F amplatz dilator which was introduced from external meatus to the bladder by using guide wıre for the urethral stenosis area

tically significant for group 1 when it is compared with group 2 (P = .02) (**Table 1**).

The major postoperative complications were urethral bleeding and urethral tract ınfections (UTI). For the Amplatz group, only one patient reported as one episode of urethral bleeding. However, in the DVIU group, 3 patients had urethral bleeding (**Table 3**).

DISCUSSION

In this study we compared amplatz dilation and DVIU, and as a result we found that amplatz dilation is more safe and effective technique for urethral stricture. In our experience, amplatz dilation a is good option as the initial treatment for urethral stricture.

The first known treatment modality of urethral stricture in history was dilation[12]. Metal or bougie urethral dilation offers several advantages over internal urethrotomy. They avoid the need for general, spinal or intravenous anesthesia. It is a simpler, less-invasive, and potentially office-based procedure that requires less degree of surgical expertise and equipment[12,13]. Because the traditional dilatation procedure is performed in a blind fashion and potential technical complications at the time of the procedure such as excessive bleeding, urethral perforation with extravasation, rectal injury, and false path[14]. To prevent these complications several modalities have been developed. Gelman et al. described direct vision balloon dilation for the trament of US and they suggested this technique[14].Yu et al reported High-pressure balloon dilation for male anterior urethral stricture and they found that this technique was effective and safe. Moreover they suggested such an alternative treatment modality for anterior urethral stricture disease[15]. The amplatz dilation method have been described by Akkoc et al.[10] which we used in this study.

The principle of conventional DVIU is to achieve epithelial regrowth by the incision of the scar tissue. The major disadvantage of DVIU is that the depth of the scar tissue cannot be estimated accurately during the procedure and resulting in imprecise incision of the scar tissue. It is possible that the incision of the urethral stric-

Figure 2. The image of 10 F amplatz dilator which was introduced from external meatus to the bladder by using guide wıre for the urethral stenosis area

Figure 4. The image of post dilatation procedure

ture may not reach the healthy tissue, so that it can not minimize the stricture recurrence effectively. Urethral epithelium metaplasia (stratified squamous) is seen as the primary change after urethral incision is more fragile than normal pseudostratified columnar epithelium [16]. On the other hand, by incising the urethra via a cold knife, the underlying corpus spongiosum might be injured, which would lead to postoperative hemorrhage. The destroyed vascularity within the corpus spongiosum and focal urinary extravasation through fissures on the mucosa might exacerbate the spongiofibrosis and finally turn to stricture recurrence[17].

There are many investigations about use of therapeutic agents such as steroids, to avoid recurrence of stricture [18,19]. Yıldırım et. al. have show that the use of local steroids injections with DVIU seems to decrease the high stricture recurrence rate following DVIU[20]. In another study conducted by Sinanoglu et al., use of oral colchicine showed reducement of the recurrence of stenosis [21]. Even if the results are controversial routine repeated dilations after DVIU are suggested by urologists to prevent urethral stricture recurrence. Tian et al. argued that close follow-up by after DVIU is more effective than recurrent dilatations in preventing recurrence of stricture[22].

There are limited randomised and prospective trials that comparing the efficacy of dilatation versus internal urethrotomy as initial treatment for urethral strictures. In one study which was a retrospective study of 199 men with strictures treated at the Mayo Clinic, 101 (67%) patients underwent dilation and 39 (26%) patients underwent direct vision internal urethrotomy. At a median follow-up of 3.5 years, the probability of not requiring re-treatment within 3 years was 65% for dilation and 68% for urethrotomy, indicating that these procedures were equally efficacious as an initial treatment of bulbar strictures[13]. JW Steenkamp and CF Heyns and ML de Kock who also compared and showed that dilation and DVIU are equally effective for initial treatment of US[23]. In our study, the recurrence rate was 6 % for the amplatz dilation during the 18 months follow up period. In the cold knife group, recurrence rate was 36 % during the 18 months follow up period.

"Time to recurrence" is also an important parameter in urethral stricture disease[24]. In the DVIU group, 2 of 30 (6,6 %) recurrences appeared within the first 3 months, whereas in the dilation group no recurrences appeared within the first 3 months in our study. Santucci et al. evaluated the success rate of DVIU as a treatment for simple male urethral strictures[8] and they found the stricture free rate after the first DVIU 8% with a median time to reccurence of 7 months. This result shows a lower success rate from the previously published studies which have reported the DVIU success rates to vary from 20% to 95% [25-28]) and they indicate that urethrotomy is popular for being an easy technique and it is not a successful procedure. In our study we found the DVIU success rate is lower than amplatz dilation and these results encourages us to suggest that the initial treatment of US should be amplatz dilation because of the higher success rate than DVIU.

There are some important limitations to our study. One of them is that we did not do the measures of strictures. The other one at the end of DVIU is that we didn't measure the urethral caliber. Another limitation is the shortness of our follow-up period. Finally our study is retrospective.

CONCLUSIONS

Treatment modality of anterior urethral stricture disease by using guidewire-assisted urethral dilation with amplatz renal dilators is safe, effective and a minimally invasive method for the treatment of urethral strictures. It also avoids the risks which is associated with blind dilatation techniques. When it is compared with cold knife technique, it provides a better recurrence free rates during the early period. In our experience, amplatz dilation is a good option as the initial treatment for urethral stricture. Further randomized studies comparing dilatation using amplatz renal dilators with DVIU are warranted.

CONFLICT OF INTEREST

None declared.

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